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TRENDS IN USSR WORK ON RODENTICIDES AND ANIMAL REPELLENTS

[Numbers in parentheses refer to appended sources.]

The bacteriological method of exterminating rodents, which has been used in Russia on a practical scale since the end of the 19th Century, although in a rather sporadic manner, is widely advocated in the USSR on the basis of work done by the All-Union Institute of Agricultural Sciences imeni Lenin. A recent article by M. Ya. Shlyakman and Ye. S. Vasserman describes improved procedures for the preparation of the rodenticides alpha-naphthylthiourea ("krysid") and phenylthiourea ("fenilkrysid"). The authors of the article take issue with the contention made by advocates of the bacteriological method that the bacteriological method is safer than the chemical method. They say that although the bacteriological method of exterminating rats, mice, and other rodents is effective, it has not been applied extensively for the following reasons: (a) the technique of applying the method is rather complicated; (b) the participation of bacteriologists is required; and (c) the bacteria used may infect rabbits, chicks, and even human beings.(1)

The background of the statement to the effect that the bacteria used or proposed for use in the extermination of rodents are dangerous appears to be as follows. N. F. Gamaleya applied in 1888 cultures of Pasteurella avium to exterminate susliks (Citellus citellus). This microorganism may infect chickens and rabbits. The bacteria of murine typhus (Bact. typhi murium) which were isolated by Loeffler from white mice in 1893 in Germany and used there for the extermination of rodents reportedly caused severe infections of human beings and farm animals.

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However, the book by M. I. Prokhorov, which deals with the bacteriological method of exterminating rodents and gives the above information on Gamaleya's and Loeffler's work, states that the Bacteria typhi spermophilorum (effective against mice) which have been isolated from susliks by S. S. Merezhkovskiy in 1893 and the bacteria which have been isolated by B. L. Isachenko (1897) and G. S. Kulesha (1898) from grey rats (effective against mice and rats) are entirely harmless. Experimental results and other data which indicate that Merezhkovskiy's and Isachenko's bacteria are harmless to useful animals and human beings are cited by Prokhorov in confirmation of this statement. On the other hand, Prokhorov points out that all chemical agents now being used in the extermination of rodents are dangerous, with the exception of alpha-naphthylthiourea. He advances the additional argument that most chemical rodenticides act as repellents: the animals to be exterminated are either repelled by the taste and odor of the poisoned bait, or refuse to consume the bait on being frightened by the effect of the toxic agent on other animals which have been poisoned.(2)

The fact that the point in regard to the dangerous nature of most chemical rodenticides is well taken is confirmed by the efforts that are being made to develop efficient methods for the production of chemical agents which have a selective toxic effect on rodents, but exhibit a relatively low toxicity towards humans and farm animals. Two such agents are alpha-naphthylthiourea and phenylthiourea. M. Ya. Shlyakman and Ye. S. Vasserman of the Chair of Chemistry, Dnepropetrovsk Agricultural Institute (the authors of the article criticizing the bacteriological method of rodent extermination), have developed a simplified procedure for the industrial production of these agents by reacting alpha-naphthylamine hydrochloride or aniline hydrochloride with sodium thiocyanate obtained from effluents derived from the coke gas purification stage of nitrogen fertilizer plants. According to the procedure described, naphthylamine is produced from alpha-nitronaphthalene obtained by nitrating crude (undistilled) naphthalene.

Shlyakman and Vasserman state that the cost of alpha-naphthylthiourea and phenylthiourea is low when these two chemicals are produced according to the procedure proposed by them and that these chemicals will therefore be applied extensively as rodenticides at homes and farms in view of their desirable characteristics. In describing the characteristics of phenylthiourea, they state that according to the data of the Moscow Scientific Research Institute of Rat Extermination, this chemical is five or six times more effective in the extermination of voles than alpha-naphthylthiourea, its toxicity to these rodents being 12-15 milligrams per kilogram of weight. The authors add that the use of phenylthiourea for the extermination of voles will be of particular importance, because these animals cause considerable losses to agriculture and furthermore transmit tularemia.(1)

Krysid (alpha-naphthylthiourea) is already available in the USSR: it is currently supplied by enterprises of the USSR Ministry of Chemical Industry, as indicated by the USSR Handbook of Chemical Products.(3) Of the six chemicals (strychnine, phosphorus, arsenic trioxide, barium carbonate, thallium sulfate, and cyanide melt) which Shlyakman and Vasserman enumerate as typical examples of substances used as rodenticides, although they are too dangerous (1), only four (phosphorus, arsenic trioxide, barium carbonate, and cyanide melt) are listed in the Handbook of Chemical Products. Of the four chemicals listed, only two (arsenic trioxide and cyanide melt) are referred to in the handbook as substances used in the extermination of rodents. On the other hand, the handbook lists zinc phosphide and chloropicrin as rodenticidal chemicals.(3)

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A recent article by J. Z. Reskin states that chloropicrin, which is used extensively for the fumigation of empty grain storage rooms and grain elevators, of cereal grains and products derived from cereal grains, and of seeds of tobacco and cotton, may cause a dangerous form of poisoning when persons are exposed to low concentrations of this substance repeatedly or for long periods. On the basis of a case history he cited, Reskin outlines the symptoms of the chronic poisoning which, according to him, differ from those of acute poisoning and have not been described before. He also describes the treatment used -- a tracheotomy in this case -- following which the patient recovered. (4)

SOURCES

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